Math 9 Lesson 6

1.4 Surface Areas of Other Objects
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SOLUTIONS

3. a) The overlap is the area of the base of the cylinder. So, instead of calculating the area of the top of the cylinder, then subtracting that area as the overlap, calculate only the curved surface area of the cylinder.

Surface area = curved surface area of cylinder + surface area of cube
= circumference of base × height of cylinder + 6 × area of cube face
$= (2 \times \pi \times 1 \times 4) + (6 \times 4 \times 4)$
$\doteq 121$
The surface area of the composite object is about 121 cm^2.

b) The overlap is the area of the base of the cylinder. So, instead of calculating the area of the top of the cylinder, then subtracting that area as the overlap, calculate only the curved surface area of the cylinder.

Surface area = curved surface area of the cylinder + surface area of the rectangular prism
= circumference of base × height of cylinder + 2 × area of top rectangular face + 2 × area of front rectangular face + 2 × area of side rectangular face
$= (2 \times \pi \times 0.5 \times 3) + (2 \times 4 \times 6) + (2 \times 3 \times 6) + (2 \times 3 \times 4)$
$\doteq 117$
The surface area of the composite object is about 117 cm^2.

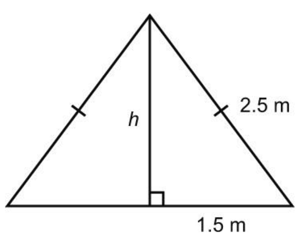
4. a) The overlap is the area of one base of the narrow cylinder. So, instead of calculating the area of the other base of the narrow cylinder, then subtracting that area as the overlap, calculate only the curved surface area of the narrow cylinder.

Surface area = curved surface area of narrow cylinder + surface area of wider cylinder
= circumference of base × height of narrow cylinder + circumference of base × height of wider cylinder + 2 × area of one circular base of wider cylinder
$= (2 \times \pi \times 0.5 \times 4.5) + (2 \times \pi \times 2 \times 1.5) + (2 \times \pi \times 2^2)$
$\doteq 58.1$
The surface area of the composite object is about 58.1 cm^2.

b) The overlap is 2 times the area of one base of the cylinder.

Surface area = surface area of cube + surface area of rectangular prism + curved surface area of cylinder – 2 × area of cylinder base overlap
$= (6 \times 2.5 \times 2.5) + (4 \times 2.5 \times 1.5) + (2 \times 1.5 \times 1.5) + (2 \times \pi \times 0.25 \times 3.5) - (2 \times \pi \times 0.25^2)$
$\doteq 62.1$
The surface area of the composite object is about 62.1 m^2.

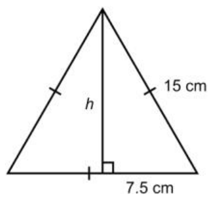
5. a)



Height, h, of the triangular base:
$h^2 + 1.5^2 = 2.5^2$
$h^2 = 2.5^2 - 1.5^2$
$= 4$
$h = \sqrt{4}$
$= 2$

The overlap is the area of the top of the cylinder. So, instead of calculating the area of the base of the cylinder, then subtracting that area as the overlap, calculate only the curved surface area of the cylinder.

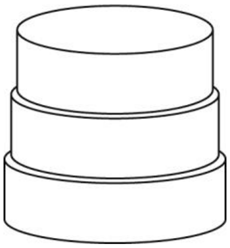
Surface area = 2 × area of triangular base + area of 3 rectangular faces of triangular prism + curved surface area of cylinder
$= (2 \times \frac{1}{2} \times 3 \times 2) + (3 \times 1) + (2.5 \times 1) + (2.5 \times 1) + (2 \times \pi \times 0.5 \times 2.5)$
$\doteq 21.9$
The surface area of the composite object is about 21.9 m^2.

6. 

Height, h, of the triangular base:
$h^2 + 7.5^2 = 15^2$
$h^2 = 15^2 - 7.5^2$
$= 168.75$
$h = \sqrt{168.75}$
$\doteq 13$
The overlap is the area of the base of the cylinder. So, instead of calculating the area of the top of the cylinder, then subtracting that area as the overlap, calculate only the curved surface area of the cylinder.

Surface area of stand (including bottom of the base)
= 2 × area of triangular base + area of 3 rectangular faces of triangular prism + curved surface area of cylinder
$\doteq (2 \times \frac{1}{2} \times 15 \times 13) + (3 \times 15 \times 3) + (2 \times \pi \times 2 \times 30)$
$\doteq 707$
The area that will be painted is about 707 cm^2.

9. a)



b) Do not include the base of the cake in the calculation because this will not be frosted.
The overlap is the area of the base of the top layer, and the area of the base of the middle layer.

Surface area = curved surface area of top layer + area of top of cake + curved surface area of middle layer + (area of top of middle layer – area of base of top layer) + curved surface of bottom layer + (area of one base of bottom layer – area of base of middle layer)

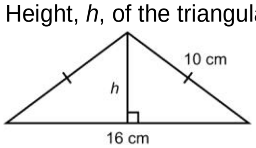
$= (2 \times \pi \times 10 \times 7.5) + (\pi \times 10^2) + (2 \times \pi \times 11.25 \times 7.5) + (\pi \times 11.25^2) - (\pi \times 10^2) + (2 \times \pi \times 12.5 \times 7.5) + (\pi \times 12.5^2) - (\pi \times 11.25^2)$

$= (2 \times \pi \times 10 \times 7.5) + (2 \times \pi \times 11.25 \times 7.5) + (2 \times \pi \times 12.5 \times 7.5) + (\pi \times 12.5^2)$

$\doteq 2081.3$

The frosted area of the cake is about 2081.3 cm^2.

11. Think of the birdhouse as a triangular prism atop of a rectangular prism.
Height, *h*, of the triangular base:



$h^2 + 8^2 = 10^2$
$h^2 = 10^2 - 8^2$
$= 36$
$h = \sqrt{36}$
$= 6$

Assume Rory does not paint the base of the birdhouse. The overlap of the perch is the area of one base of the perch. So, instead of calculating the area of one base of the perch, then subtracting that area as the overlap, calculate only the curved surface area of the perch.

Surface area = 2 × area of triangular base + area of 2 rectangular faces of triangular prism + 2 × area of front face of rectangular prism + 2 × area of side face of rectangular prism + curved surface area of perch – area of entrance

$= (2 \times \frac{1}{2} \times 16 \times 6) + (2 \times 10 \times 15) + (2 \times 12 \times 16) + (2 \times 12 \times 15) + (2 \times \pi \times 0.5 \times 7) - (\pi \times 1.5^2)$

$\doteq 1155$

The area that needs to be painted is about 1155 cm^2.